"Express Mail" mailing label number EL339002561US

Date of Deposit. October 17, 2001

Our Case No.8864/24

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR UNITED STATES LETTERS PATENT



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TITLE: METHOD OF ENCAPSULATING HARD DISC DRIVE AND OTHER ELECTRICAL COMPONENTS

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# METHOD OF ENCAPSULATING HARD DISC DRIVE AND OTHER ELECTRICAL COMPONENTS

## BACKGROUND OF THE INVENTION

The present invention relates generally to hard disc drives, hard disc drive components and other electrical components having a more uniform and predictable, and in some cases modified, resonance spectrum. Particularly, it relates to the structure, construction and arrangement of hard disc drive components or other electrical components to obtain a more uniform and predictable and otherwise improved resonance spectrum.

Computers commonly use disc drives for memory storage purposes. Disc drives include a stack of one or more magnetic discs that rotate and are accessed using a head or read-write transducer. Typically, a high speed motor such as a spindle motor is used to rotate the discs. Voice coil motors are typically used in actuator assemblies to move the heads over the discs.

In many electrically motorized hard disc drive applications, significant mechanical vibration and acoustic noise is generated from both the mechanical and magnetic sources. Mechanical sources include, but are not limited to, things such as static and/or dynamic imbalance of the rotating parts, bearing elasticity and imperfections, windage, and other mechanical means of creating fluctuating forces. In an electric motor, magnetic sources include such things as the magnetostriction from commutation of the current in the electric coils, magnetic force imbalance from arrangement of the poles, slots and coils, and magnetic force imbalance due to eccentricity of the rotor and/or the stator. The vibration from mechanical and magnetic sources usually has an adverse effect on the performance

of the motorized spindle. In hard disc drive applications, motor vibration creates undesirable acoustic noise, angular speed variations and data-track mis-registration. It is therefore desirable to reduce the sources of vibration as much as possible.

In hard disc drive applications, it is desirable to have a drive that has a predictable system-wide resonance. The various components in a hard disc drive have their own unique resonance spectrum when the disc drive is in operation. The combination of these resonance spectrums define the system wide resonance spectrum of the hard disc drive. Components such as voice coil motors and spindle motors have subcomponents which also have their unique resonance spectrum. The combination of the resonance spectrums of the motor subcomponents define the system wide resonance for the motor. Sometimes a particular frequency of vibration in one part can couple with the resonate frequency of another part creating a node of energy that is undesirable. As an example a motor bearing may have a defect frequency at 1250 hertz which may excite a resonate frequency of the motor bracket causing a system wide vibration of the motor assembly. Therefore it is desirable to tune the motor so that points of excitation can be manipulated to avoid this excitation phenomena. It is also common that different manufacturers install the various components in the hard disc drive. These variations in system wide resonance must be accounted for in the manufacturing process. A large range of variance in system wide resonance, is a limiting factor in designing servo control logic to drive the heads over the data, in turn limiting the ability of the heads to track the repeatable runout of the media